The mean diameter of the polymer particles in the latex was about 26 nm. 100 ml of such a latex, 0.13 gram of the catalyst $RhCl(PPh_3)_3$ and 1.3 gram of PPh_3 were charged into the reactor. The agitation speed was 600 rpm. The latex was then degassed with hydrogen. The temperature was increased to 160°C and hydrogen pressure was raised up to 1000 psi (6.8MPa). The reaction time was 0.25 hr. The hydrogenation degree was 43.2%.

The result indicates that when such synthesized latex of nanosized diene-based polymer particles, the hydrogenation speed can be significantly speeded up.

Example 2

The same procedures and reaction conditions as described in Example 1 were employed except the hydrogenation reaction time was 0.38 hr. 81.9% of hydrogenation degree was obtained.

Example 3

The same procedures and reaction conditions as described in Example 1 were employed except the hydrogenation reaction time was 1 hr. A hydrogenation degree of 91% was achieved.

The result indicated that within 1 hour the hydrogenation degree reached over 90%.

Although the invention has been described in detail in the foregoing for the purpose of illustration, it is to be understood that such detail is solely for that purpose and that variations can be made therein by those skilled in the art without departing from the spirit and scope of the invention except as it may be limited by the claims.

Nano-sized hydrogenated diene-based latex particles

Claims

1. Diene-based hydrogenated polymer latex particles having a particle size measured as d_{90}-value of less than 30 nm.

2. Latex particles according to claim 1, wherein the diene-based latex particles are acrylonitrile-butadiene polymers.

3. Process for the selective hydrogenation of diene-based unsaturated polymer particles in latex form, comprising

   a) providing diene-based unsaturated polymer particles having a particle size measured as d_{90}-value of less than 60 nm

   b) combining the diene-based unsaturated polymer in latex form with hydrogen or a hydrogen-source in the presence of

   c) a transition metal containing catalyst and preferably

   d) maintaining a temperature of from about 35 °C to about 180 °C, preferably from about 80 °C to about 160 °C,

   wherein the catalyst corresponds to the formula

   $RhQL_x$

   wherein Q is hydrogen or an anion, preferably a halide and more preferably a chloride or bromide ion wherein

   L is a ligand compound of the formula R_mB, wherein

   R is a C_1-C_8-alkyl group, a C_4-C_8-cycloalkyl group a C_6-C_{15}-aryl group or a C_7-C_{15}-aralkyl group,

B is phosphorus, arsenic, sulfur, or a sulphoxide group, and

m is 2 or 3, and wherein

x is 2, 3 or 4.

4. Process according to claim 3, wherein the particle size of the polymer particles measured as d_{90}-value is less than 20 nm.

5. Process according to at least one of the preceding claims, wherein the hydrogenation is conducted at a temperature of 35 to about 180°C.

6. Process according to at least one of the preceding claims, wherein the hydrogenation is carried out with essentially pure hydrogen gas at a pressure of 0.1 to about 20 MPa.

7. Process according to at least one of the preceding claims, wherein the unsaturated polymer is composed of a conjugated diene D, a copolymerizable monomer A containing a nitrile group and optionally further copolymerizable monomers C.

8. Process according to at least one of the preceding claims, wherein the unsaturated polymer is an acrylonitrile/butadiene copolymer.

9. Process according to at least one of the preceding claims, wherein the hydrogenation is conducted in a batch mode.

10. Process according to at least one of the preceding claims, wherein the hydrogenation is conducted in a continuous or semi-batch mode.

11. Use of hydrogenated polymer obtained according to at least one of the preceding claims for the production of shaped articles.

The mean diameter of the polymer particles in the latex was about 26 nm. 100 ml of such a latex, 0.13 gram of the catalyst $RhCl(PPh_3)_3$ and 1.3 gram of PPh_3 were charged into the reactor. The agitation speed was 600 rpm. The latex was then degassed with hydrogen. The temperature was increased to 160°C and hydrogen pressure was raised up to 1000 psi (6.8MPa). The reaction time was 0.25 hr. The hydrogenation degree was 43.2%.

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   a) providing diene-based unsaturated polymer particles having a particle size measured as d_{90}-value of less than 60 nm

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B is phosphorus, arsenic, sulfur, or a sulphoxide group, and

m is 2 or 3, preferably m is 2 when B is sulphur or sulphoxide, and m is 3 when B is phosphorus or arsenic, and wherein

x is 2, 3 or 4, preferable x is 3 when Q is halogen and preferably x is 4 when Q is hydrogen.

4. Process according to claim 3, wherein the particle size of the polymer particles measured as d_{90}-value is less than 20 nm.

5. Process according to claim 3 or 4, wherein the hydrogenation is conducted at a temperature of 80 to about 160°C.

6. Process according to any one of claims 3 to 5, wherein the hydrogenation is carried out with essentially pure hydrogen gas at a pressure of 0.1 to about 20 MPa.

7. Process according to any one of claims 3 to 6, wherein the unsaturated polymer is composed of a conjugated diene D, a copolymerizable monomer A containing a nitrile group and optionally further copolymerizable monomers C.

8. Process according to any one of claims 3 to 7, wherein the unsaturated polymer is an acrylonitrile/butadiene copolymer.

9. Process according to any one of claims 3 to 8, wherein the hydrogenation is conducted in a batch mode.

10. Process according to any one of claims 3 to 9, wherein the hydrogenation is conducted in a continuous or semi-batch mode.

11. Use of hydrogenated polymer obtained according to at least one of the preceding claims for the production of shaped articles.